# Air Quality Permitting
# Technical Memorandum

April 9, 2003

## TIER II Operating Permit and Permit to Construct No. T2-010511

## BRIGHAM YOUNG UNIVERSITY IDAHO
## REXBURG, IDAHO

## AIRS Facility No. 065-00011


*Prepared By:*

*Kent Berry*
*Environmental Quality Management, Inc.*

*Updated By:*

*Mike Simon*
*Permit Coordinator*


FINAL

# TABLE OF CONTENTS

# ACRONYMS, UNITS AND CHEMICAL NOMENCLATURE

| | |
|---|---|
| acfm | actual cubic feet per minute |
| AFS | AIRS Facility Subsystem |
| AIRS | Aerometric Information Retrieval System |
| CFR | Code of Federal Regulations |
| CO | carbon monoxide |
| DEQ | Idaho Department of Environmental Quality |
| dscf | dry standard cubic feet |
| EPA | Environmental Protection Agency |
| gr | grain (1 lb = 7,000 grains) |
| HAPs | Hazardous Air Pollutants |
| IDAPA | A numbering designation for all administrative rules in Idaho promulgated in accordance with the Idaho Administrative Procedures Act |
| kW | Kilowatt |
| lb/hr | pound per hour |
| MACT | Maximum Available Control Technology |
| MMBtu | million British thermal units |
| NESHAP | Nation Emission Standards for Hazardous Air Pollutants |
| $NO_2$ | nitrogen dioxide |
| $NO_X$ | nitrogen oxides |
| NSPS | New Source Performance Standards |
| PM | particulate matter |
| $PM_{10}$ | particulate matter with an aerodynamic diameter of 10 micrometers or less |
| PSD | Prevention of Significant Deterioration |
| PTC | permit to construct |
| scf | standard cubic feet |
| SIP | State Implementation Plan |
| $SO_2$ | sulfur dioxide |
| T/yr | tons per year |
| UTM | Universal Transverse Mercator |
| VOC | volatile organic compound |

## PURPOSE

The purpose for this memorandum is to satisfy the requirements of the *Rules for the Control of Air Pollution in Idaho* IDAPA 58.01.01, Sections 200 and 404, et seq., for issuing Permits to Construct and Tier II operating permits.

## PROJECT DESCRIPTION

Brigham Young University Idaho (BYU Idaho) requested renewal of Tier II operating permit 065-00011, originally issued to Ricks College on August 12, 1996. A new gas and oil fired boiler has been added without a PTC and an existing coal fired boiler has been shut down. The PTC requirements of IDAPA 58.01.01.200 et. seq. have been incorporated into this permit for the new boiler.

The emission sources covered by the permit are as follows:

**Table 1.1 REGULATED EMISSION SOURCES**

| Permit Section | Source Description | Emissions Control(s) |
|---|---|---|
| 3 | Boiler No.2, Erie City Iron Works Model 16792 H.S.B, stoker coal-fired, 26.7 MMBtu/hr, installed 1963 | Multi-clone |
| 3 | Boiler No.3, Union Iron Works Model 234-28, stoker coal fired, 40 MMBtu/hr, installed 1966 | Multi-clone |
| 3 | Boiler No.4, Keeler Watertube MK, stoker coal fired, 46.7 MMBtu/hr, installed 1973 | Multi-clone |
| 3 | Boiler No.5, Indeck/Volcano 02-40-X, gas and No.2 oil fired (transition fuel), 51.0 MMBtu/hr on gas, 48.25 MM Btu/hr on oil, installed 2001 | None |
| 4 | Emergency Generator No.429, Cummins Model NTA 855GS2, diesel fired, 300 kW, located in heating plant | None |
| 4 | Emergency Generator No.434, Onan Model 30 DDa, diesel fired, 30 kW, located in physical plant, Building 83 | None |
| 4 | Emergency Generator No.442, Kohler 60ROZ5, diesel fired, 60 kW, located at Manwaring Center, Building No.7 | None |
| 4 | Emergency Generator No.473, Kohler Model 20R0P81, diesel fired, 20 kW, located at Kirkham, Building No.3 | None |
| 4 | Emergency Generator No.477, Generac diesel fired, 100 kW, located at Hart, Building No.9 | None |
| 4 | Emergency Generator No.479, Kohler Model 30R081, diesel-fired, 30 kW, located at auxiliary services, Building No.90 | None |
| 4 | Emergency Generator No.423, Onan Model RDJC-4R/14AD, diesel fired, 15 kW, located at Austin, Building No.10 | None |
| 4 | Emergency Generator No.404, Onan Model DVA-15R/29163A, diesel fired, 50 kW, located at Romney, Building No.5 | None |
| 4 | Emergency Generator No.431, Kohler 60ROZJ71 diesel fired, 80 kW, located at the library, Building No.4 | None |
| 4 | Emergency Generator No.413, Onan Model DDA-15R/21694D, diesel fired, 30 kW, located at Benson, Building No.11 | None |
| 4 | Emergency Generator No.480, Olympian Model 94A3525-S, diesel fired, 60 kW, located at Smith, Building No.8 | None |
| 4 | Emergency Generator No.401, Generac 176919010, diesel fired, 15 kW, located at Clark, Building No.6 | None |
| 4 | Emergency Generator No.403, Onan Model DDA-15R/18796D, diesel fired, 30 kW, located at Snow, Building No.12 | None |
| 4 | Emergency Generator 447, Cummins, diesel fired, 250 kW, portable | None |
| 4 | Emergency Generator AOE, Caterpillar Model 4Z03819, diesel-fired 438 kW, located at Kimball Building | None |
| 4 | Emergency Generator AIW, Generac 176919019, diesel-fired 40 kW, located at Radio Graphic Services | None |
| 5 | Ash handling system | Baghouse |

## FACILITY DESCRIPTION

The air emission sources at BYU Idaho consists of 3 coal-fired boilers, a new oil and gas-fired boiler, and 13 emergency generators as listed in Table 1.1.

## SUMMARY OF EVENTS

| | |
|---|---|
| September 24, 2001 | BYU Idaho requested renewal and changes to Tier II Operating Permit No. 065-00011, issued on August 12, 1996, to Ricks College. |
| February 15, 2002 | DEQ determined the application to be incomplete. |
| March 29, 2002 | BYU Idaho submitted a response to the incompleteness determination. |
| April 22, 2002 | DEQ determined the application complete. |
| October 28, 2002 | DEQ issued a draft permit for facility review. |
| December 2, 2002 | A meeting was held between DEQ and BYU-Idaho to discuss outstanding issues on the facility draft permit. |
| February 14, 2003 | DEQ issued a proposed permit for public comment. |
| February 26 – March 31 2003 | A 30 day public comment period was held. No comments were received. |

## PERMIT HISTORY

The following is a summary of the permit files available to Environmental Quality Management.

| | |
|---|---|
| September 4, 1990 | A PTC was issued for 4 coal-fired boilers to Ricks College. |
| August 12, 1996 | The original Tier II operating permit was issued to Ricks College. |

## DISCUSSION

1. Emission Estimates

   Potential emission estimates for all the current equipment, using the latest EPA emission factors and operating limits in the permit, are presented in Appendix A.

2. Modeling

   The addition of Boiler No. 5 triggers the requirement for a dispersion modeling analysis to demonstrate compliance with the NAAQS and TAPs that exceeded the emission screening levels (ELs) in IDAPA 58.01.01.585 and 586. Because the facility requested relief from the requirement to conduct and submit this analysis, a modeling analysis using the ISC PRIMME model was conducted by Environmental Quality Management, Inc. (EQ). As discussed in Appendix B and Section 6 below, the modeling resulted in the addition of several permit conditions to ensure compliance with the NAAQS for $SO_2$ and $PM_{10}$.

3. Facility Classification

BYU Idaho is not a major facility as defined in IDAPA 58.01.01.008. This AIRS classification for this facility is SM, which is defined as a synthetic minor facility with actual and potential emissions of regulated air pollutants below major source thresholds only if it complies with the federally enforceable conditions in this permit.

4. Area Classification

BYU Idaho is located in Rexburg in Madison County, Idaho, which is in Air Quality Control Region 61. Madison County is designated as attainment or unclassified for all criteria air pollutants.

5. Regulatory Review

IDAPA 58.01.01.201 Permit to Construct Required

This project involves the addition of Boiler No. 5. This modification triggers permit to construct requirements and is incorporated into this permit.

IDAPA 58.01.01.210 Demonstration of Preconstruction Compliance with Toxic Standards

The addition of Boiler No. 5 requires a TAP analysis for this source. The emission screening levels (ELs) in IDAPA 58.01.01.585 and 586 were exceeded for five TAP's: formaldehyde and five metals. A modeling analysis was conducted for these pollutants as discussed in Section 2. The analysis demonstrates that Boiler No. 5 complies with the toxic standards specified in IDAPA 58.01.01.585 and 586. It should be noted that the total impact of the facility, including the non-modified existing coal-fired boilers, exceeds the AACC for arsenic and chromium +6. Details of the analysis can be found in Appendix B.

IDAPA 58.01.01.401 thru 470 Tier II Operating Permit

BYU Idaho located in Rexburg, Idaho, operates under a Tier II operating permit number 065-00011 originally issued to Ricks College. This permit was originally issued on August 12, 1996 and expired on August 12, 2001. This action is for the modification and renewal of this operating permit.

IDAPA 58.01.01.577 Ambient Air Quality Standards for Specific Air Pollutants

As discussed in Section 2, a modeling analysis was conducted for Boilers 2-5 and Emergency Generator No. 1 which demonstrated compliance with the National Ambient Air Quality Standards (NAAQS).

40 CFR 52 Prevention of Significant Deterioration (PSD)

PSD requirements do not apply to BYU Idaho because it is not a major facility as defined in IDAPA 58.01.01.008.10.

40 CFR 60 New Source Performance Standards (NSPS)

The NSPS for Small Industrial-Commercial-Institutional Steam Generating Units (40 CFR 60, Subpart Dc) is applicable to Boiler No. 5.

40 CFR 61 & 63 National Emission Standards for Hazardous Air Pollutants (NESHAP) & Maximum Achievable Control Technology (MACT)

No subparts of 40 CFR 61 or 63 are applicable to units at BYU Idaho.

6. Permit Requirements

Because of the addition of Boiler No. 5, which emits $SO_2$ from the combustion of oil, the allowable emissions and coal consumption limits for the remaining coal-fired boilers were reduced to maintain the facility's SM status. The individual boiler emission limits were replaced with a single emission limit for all boilers. Compliance with the boiler emission limits (except for particulate matter (PM)) will be insured by compliance with the coal consumption limit, the coal and oil sulfur limits, and the limit on operating hours while burning fuel oil in Boiler No. 5.

The monitoring, recordkeeping and reporting requirements from the original Tier II permit have generally been retained, with the addition of requirements specified in 40 CFR 60, Subpart Dc for Boiler No. 5. Emission limits have been set only for those pollutants whose potential emissions *exceed 10% of the significant emission rates at* IDAPA 58.01.01.006.92.

The frequency of the PM source tests for the coal-fired boilers has been changed to be a function of how close to the emission standard the boiler was in the previous test. For example, if the grain loading in the previous test was less than 75% of the standard, a subsequent test is required within the next five years. If the grain loading was greater than 90 percent of the standard, a subsequent test is required within the next 12 months. Because the last test on the boilers in February 2000 indicated that emissions were less than 75% of the grain-loading standard of 0.1 gr/dscf for each boiler, the next test is not required until 2 years from the date of this permit.

As discussed in Appendix B, it was necessary to add several conditions to ensure attainment of the NAAQS for $PM_{10}$ and $SO_2$. Based on the modeling analysis, conditions have been added to require that the coal boiler stacks be increased to 80 feet above grade. The permit includes a compliance *schedule which requires the completion of the stack height increase no later than three years after* issuance of the final permit.

7. AIRS Information

**AIRS/AFS[a] FACILITY-WIDE CLASSIFICATION[b] DATA ENTRY FORM**

| AIR PROGRAM / POLLUTANT | SIP | PSD | NSPS (Part 60) | NESHAP (Part 61) | MACT (Part 63) | TITLE V | AREA CLASSIFICATION A – Attainment U – Unclassifiable N – Nonattainment |
|---|---|---|---|---|---|---|---|
| $SO_2$ | SM | | | | | | A |
| $NO_x$ | SM | | | | | | U |
| CO | SM | | | | | | U |
| $PM_{10}$ | SM | | | | | | U |
| PT (Particulate) | SM | | | | | | A |
| VOC | B | | | | | | U |
| THAP (Total HAPs) | NA | | | | | | NA |
| | | | APPLICABLE SUBPART | | | | |
| | | | Dc | | | | |

[a] Aerometric Information Retrieval System (AIRS) Facility Subsystem (AFS)

[b] AIRS/AFS Classification Codes:

A = Actual or potential emissions of a pollutant are above the applicable major source threshold. For NESHAP only, class "A" is applied to each pollutant which is below the 10 ton-per-year (T/yr) threshold, but which contributes to a plant total in excess of 25 T/yr of all NESHAP pollutants.

SM = Potential emissions fall below applicable major source thresholds if and only if the source complies with federally enforceable regulations or limitations.

B = Actual and potential emissions below all applicable major source thresholds.

C = Class is unknown.

ND = Major source thresholds are not defined (e.g., radionuclides).

## FEES

Fees apply to this facility in accordance with IDAPA 58.01.01.470 because the original application for renewal was received 10/4/01, well before the new fee structure was effective on July 1, 2002. BYU-Idaho will be required to pay the Tier II fee applicable at the time the application was submitted which is $500.00.

## RECOMMENDATION

Based on the review of the application materials, and all applicable state and federal regulations, staff recommends that DEQ issue a final Tier II operating permit and permit to construct to BYU Idaho. An opportunity for public comment on the air quality aspects of the proposed permit was provided in accordance with IDAPA 58.01.01.404.01.c and no comments were received.

KB/MS:sm Permit No. T2-010511 G:\Air Quality\Stationary Source\SS Ltd\T2\BYU-Idaho\Final Prep\T2-010511 BYU Final TM.doc

cc: Jorge Garcia, Idaho Falls Regional Office

# APPENDIX A

# POTENTIAL EMISSION ESTIMATES

Potential Emissions from Boilers
BYU - Idaho

| Source ID | Rated Capacity (MMBtu/hr) | Rated Capacity (MMscf/hr) | Fuel Rate (1000 gal/hr) | Coal Rate (ton/yr) | Coal Rate (ton/hr) | Fuel Type | Operating Hours (hr/yr) | Grain Loading (gr/dscf) | Flow Rate (dscfm) |
|---|---|---|---|---|---|---|---|---|---|
| # 2 (Coal) | 26.7 | | | 1953 | 1.07E+00 | Coal | 1831 | 0.1 | 8500 |
| ***# 2 TOTAL*** | | | | | | | | | |
| | | | | | | | | | |
| # 3 (Coal) | 40.0 | | | 2929 | 1.60E+00 | Coal | 1831 | 0.1 | 16000 |
| ***# 3 TOTAL*** | | | | | | | | | |
| | | | | | | | | | |
| # 4 (Coal) | 46.7 | | | 3418 | 1.87E+00 | Coal | 1831 | 0.1 | 16000 |
| ***# 4 TOTAL*** | | | | | | | | | |
| | | | | | | | | | |
| # 5 (Nat. Gas) | 51.0 | 5.00E-02 | | | | Nat. Gas | 8360 | 0.015 | 18000 |
| | | | | | | | | | |
| # 5 (Fuel Oil)* | 48.3 | | 3.45E-01 | | | Fuel Oil | 400 | 0.05 | 18000 |
| ***# 5 TOTAL*** | | | | | | | | | |
| **GRAND TOTAL**** | | | | 8300 | | | | | |

* Fuel oil usage restricted to 400 hr/yr

1. Natural Gas Emission factors per 5th Edition AP-42, 1.4 Natural Gas Combustion (7-98)
   Fuel Oil Emission Factors per 5th Edition AP-42, 1.3 Fuel Oil Combustion (9-98)
   Coal Emission Factors per 5th Edition AP-42, 1.1 Bituminous and Subbituminous Coal Combustion (9-98)
2. PM10/PM ratio for spreader stoker with multiclone = 0.65 (AP-42 Table 1.1-9)

Exceeds emission screening level

** For hourly rates Boilers 2, 3, and 4 only - worst case per permit limits
(if no emission factors available for coal then Boiler #5 total used for worst case)

Potential Emissions from Boilers
BYU - Idaho

| | Potential Hourly Emissions | | | | | | |
|---|---|---|---|---|---|---|---|
| Source ID | PM | PM10 | $SO_2$ | VOC | $NO_x$ | CO | PAH |
| | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) |
| # 2 (Coal) | 7.29E+00 | 4.74E+00 | 2.43E+01 | 0.00E+00 | 1.17E+01 | 5.33E+00 | 2.21E-05 |
| ***# 2 TOTAL*** | ***7.29E+00*** | ***4.74E+00*** | ***2.43E+01*** | ***0.00E+00*** | ***1.17E+01*** | ***5.33E+00*** | ***2.21E-05*** |
| | | | | | | | |
| # 3 (Coal) | 1.37E+01 | 8.91E+00 | 3.65E+01 | 0.00E+00 | 1.76E+01 | 8.00E+00 | 3.32E-05 |
| ***# 3 TOTAL*** | ***1.37E+01*** | ***8.91E+00*** | ***3.65E+01*** | ***0.00E+00*** | ***1.76E+01*** | ***8.00E+00*** | ***3.32E-05*** |
| | | | | | | | |
| # 4 (Coal) | 1.37E+01 | 8.91E+00 | 4.26E+01 | 0.00E+00 | 2.05E+01 | 9.33E+00 | 3.88E-05 |
| ***# 4 TOTAL*** | ***1.37E+01*** | ***8.91E+00*** | ***4.26E+01*** | ***0.00E+00*** | ***2.05E+01*** | ***9.33E+00*** | ***3.88E-05*** |
| | | | | | | | |
| # 5 (Nat. Gas) | 2.31E+00 | 2.31E+00 | 3.00E-02 | 2.75E-01 | 2.50E+00 | 4.20E+00 | 3.49E-05 |
| | | | | | | | |
| # 5 (Fuel Oil)* | 1.14E+00 | 1.14E+00 | 1.96E+01 | 6.90E-02 | 6.90E+00 | 1.73E+00 | 2.09E-05 |
| ***# 5 TOTAL*** | ***2.31E+00*** | ***2.31E+00*** | ***1.96E+01*** | ***2.75E-01*** | ***6.90E+00*** | ***4.20E+00*** | ***3.49E-05*** |
| **GRAND TOTAL**** | **3.47E+01** | **2.26E+01** | **1.03E+02** | **2.75E-01** | **4.99E+01** | **2.27E+01** | **9.41E-05** |

Potential Emissions from Boilers
BYU - Idaho

| | Potential Hourly Emissions | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Source ID | Benzene | Ethylbenzene | Formaldehyde | Napthalene | Hexane | Pentane | Toluene | o-Xylene |
| | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) |
| # 2 (Coal) | 1.39E-03 | 1.00E-04 | 2.56E-04 | 0.00E+00 | 7.15E-05 | 0.00E+00 | 2.56E-04 | 3.95E-05 |
| ***# 2 TOTAL*** | ***1.39E-03*** | ***1.00E-04*** | ***2.56E-04*** | ***0.00E+00*** | ***7.15E-05*** | ***0.00E+00*** | ***2.56E-04*** | ***3.95E-05*** |
| | | | | | | | | |
| # 3 (Coal) | 2.08E-03 | 1.50E-04 | 3.84E-04 | 0.00E+00 | 1.07E-04 | 0.00E+00 | 3.84E-04 | 5.92E-05 |
| ***# 3 TOTAL*** | ***2.08E-03*** | ***1.50E-04*** | ***3.84E-04*** | ***0.00E+00*** | ***1.07E-04*** | ***0.00E+00*** | ***3.84E-04*** | ***5.92E-05*** |
| | | | | | | | | |
| # 4 (Coal) | 2.43E-03 | 1.75E-04 | 4.48E-04 | 0.00E+00 | 1.25E-04 | 0.00E+00 | 4.48E-04 | 6.91E-05 |
| ***# 4 TOTAL*** | ***2.43E-03*** | ***1.75E-04*** | ***4.48E-04*** | ***0.00E+00*** | ***1.25E-04*** | ***0.00E+00*** | ***4.48E-04*** | ***6.91E-05*** |
| | | | | | | | | |
| # 5 (Nat. Gas) | 1.05E-04 | 0.00E+00 | 3.75E-03 | 0.00E+00 | 9.00E-02 | 1.30E-01 | 1.70E-04 | 0.00E+00 |
| | | | | | | | | |
| # 5 (Fuel Oil)* | 7.38E-05 | 2.19E-05 | 1.14E-02 | 3.90E-04 | 0.00E+00 | 0.00E+00 | 2.14E-03 | 3.76E-05 |
| ***# 5 TOTAL*** | ***1.05E-04*** | ***2.19E-05*** | ***1.14E-02*** | ***3.90E-04*** | ***9.00E-02*** | ***1.30E-01*** | ***2.14E-03*** | ***3.76E-05*** |
| **GRAND TOTAL**** | **5.89E-03** | **4.26E-04** | **1.09E-03** | **3.90E-04** | **3.04E-04** | **1.30E-01** | **1.09E-03** | **1.68E-04** |

Potential Emissions from Boilers
BYU - Idaho

| | Potential Hourly Emissions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Source ID | Arsenic | Beryllium | Cadmium | Chromium | Chromium+6 | Cobalt | Copper | Lead | Manganese | Mercury |
| | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) |
| # 2 (Coal) | 5.37E-03 | 0.00E+00 | 4.27E-04 | #VALUE! | #VALUE! | 0.00E+00 | 0.00E+00 | 6.76E-03 | 0.00E+00 | 0.00E+00 |
| ***# 2 TOTAL*** | ***5.37E-03*** | ***0.00E+00*** | ***4.27E-04*** | ***#VALUE!*** | ***#VALUE!*** | ***0.00E+00*** | ***0.00E+00*** | ***6.76E-03*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | | | | | | | |
| # 3 (Coal) | 8.06E-03 | 0.00E+00 | 6.40E-04 | #VALUE! | #VALUE! | 0.00E+00 | 0.00E+00 | 1.01E-02 | 0.00E+00 | 0.00E+00 |
| ***# 3 TOTAL*** | ***8.06E-03*** | ***0.00E+00*** | ***6.40E-04*** | ***#VALUE!*** | ***#VALUE!*** | ***0.00E+00*** | ***0.00E+00*** | ***1.01E-02*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | | | | | | | |
| # 4 (Coal) | 9.40E-03 | 0.00E+00 | 7.47E-04 | #VALUE! | #VALUE! | 0.00E+00 | 0.00E+00 | 1.18E-02 | 0.00E+00 | 0.00E+00 |
| ***# 4 TOTAL*** | ***9.40E-03*** | ***0.00E+00*** | ***7.47E-04*** | ***#VALUE!*** | ***#VALUE!*** | ***0.00E+00*** | ***0.00E+00*** | ***1.18E-02*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | | | | | | | |
| # 5 (Nat. Gas) | 1.00E-05 | 6.00E-07 | 5.50E-05 | 7.00E-05 | 2.10E-05 | 4.20E-06 | 4.25E-05 | 0.00E+00 | 1.90E-05 | 1.20E-05 |
| | | | | | | | | | | |
| # 5 (Fuel Oil)* | 1.93E-04 | 1.45E-04 | 1.45E-04 | 1.45E-04 | 4.35E-05 | 0.00E+00 | 2.90E-04 | 4.35E-04 | 2.90E-04 | 1.45E-04 |
| ***# 5 TOTAL*** | ***1.93E-04*** | ***1.45E-04*** | ***1.45E-04*** | ***1.45E-04*** | ***4.35E-05*** | ***4.20E-06*** | ***2.90E-04*** | ***4.35E-04*** | ***2.90E-04*** | ***1.45E-04*** |
| **GRAND TOTAL**** | **2.28E-02** | **1.45E-04** | **1.81E-03** | **#VALUE!** | **#VALUE!** | **4.20E-06** | **2.90E-04** | **2.87E-02** | **2.90E-04** | **1.45E-04** |

Potential Emissions from Boilers
BYU - Idaho

| Source ID | Nickel | Selenium | Vanadium | Zinc |
|---|---|---|---|---|
| | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) |
| # 2 (Coal) | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ***# 2 TOTAL*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | |
| # 3 (Coal) | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ***# 3 TOTAL*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | |
| # 4 (Coal) | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ***# 4 TOTAL*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | |
| # 5 (Nat. Gas) | 1.05E-04 | 1.20E-06 | 1.15E-04 | 1.45E-03 |
| | | | | |
| # 5 (Fuel Oil)* | 1.45E-04 | 7.25E-04 | 0.00E+00 | 1.93E-04 |
| ***# 5 TOTAL*** | ***1.45E-04*** | ***7.25E-04*** | ***1.15E-04*** | ***1.45E-03*** |
| **GRAND TOTAL**** | **1.45E-04** | **7.25E-04** | **1.15E-04** | **1.45E-03** |

Potential Emissions from Boilers
BYU - Idaho

| | Potential Annual Emissions | | | | | | |
|---|---|---|---|---|---|---|---|
| Source ID | PM | PM10 | $SO_2$ | VOC | $NO_x$ | CO | PAH |
| | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) |
| # 2 (Coal) | 6.67E+00 | 4.34E+00 | 2.23E+01 | 0.00E+00 | 1.07E+01 | 4.88E+00 | 2.03E-05 |
| ***# 2 TOTAL*** | ***6.67E+00*** | ***4.34E+00*** | ***2.23E+01*** | ***0.00E+00*** | ***1.07E+01*** | ***4.88E+00*** | ***2.03E-05*** |
| | | | | | | | |
| # 3 (Coal) | 1.26E+01 | 8.16E+00 | 3.34E+01 | 0.00E+00 | 1.61E+01 | 7.32E+00 | 3.04E-05 |
| ***# 3 TOTAL*** | ***1.26E+01*** | ***8.16E+00*** | ***3.34E+01*** | ***0.00E+00*** | ***1.61E+01*** | ***7.32E+00*** | ***3.04E-05*** |
| | | | | | | | |
| # 4 (Coal) | 1.26E+01 | 8.16E+00 | 3.90E+01 | 0.00E+00 | 1.88E+01 | 8.55E+00 | 3.55E-05 |
| ***# 4 TOTAL*** | ***1.26E+01*** | ***8.16E+00*** | ***3.90E+01*** | ***0.00E+00*** | ***1.88E+01*** | ***8.55E+00*** | ***3.55E-05*** |
| | | | | | | | |
| # 5 (Nat. Gas) | 9.67E+00 | 9.67E+00 | 1.25E-01 | 1.15E+00 | 1.05E+01 | 1.76E+01 | 1.46E-04 |
| | | | | | | | |
| # 5 (Fuel Oil)* | 2.28E-01 | 2.28E-01 | 3.92E+00 | 1.38E-02 | 1.38E+00 | 3.45E-01 | 4.18E-06 |
| ***# 5 TOTAL*** | ***9.90E+00*** | ***9.90E+00*** | ***4.04E+00*** | ***1.16E+00*** | ***1.18E+01*** | ***1.79E+01*** | ***1.50E-04*** |
| **GRAND TOTAL**** | **4.17E+01** | **3.06E+01** | **9.87E+01** | **1.16E+00** | **5.75E+01** | **3.87E+01** | **2.36E-04** |

Potential Emissions from Boilers
BYU - Idaho

| Source ID | Potential Annual Emissions | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Benzene** | **Ethylbenzene** | Formaldehyde | Napthalene | Hexane | Pentane | Toluene | o-Xylene |
| | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) |
| # 2 (Coal) | 1.27E-03 | 9.18E-05 | 2.34E-04 | 0.00E+00 | 6.54E-05 | 0.00E+00 | 2.34E-04 | 3.61E-05 |
| ***# 2 TOTAL*** | ***1.27E-03*** | ***9.18E-05*** | ***2.34E-04*** | ***0.00E+00*** | ***6.54E-05*** | ***0.00E+00*** | ***2.34E-04*** | ***3.61E-05*** |
| | | | | | | | | |
| # 3 (Coal) | 1.90E-03 | 1.38E-04 | 3.52E-04 | 0.00E+00 | 9.81E-05 | 0.00E+00 | 3.52E-04 | 5.42E-05 |
| ***# 3 TOTAL*** | ***1.90E-03*** | ***1.38E-04*** | ***3.52E-04*** | ***0.00E+00*** | ***9.81E-05*** | ***0.00E+00*** | ***3.52E-04*** | ***5.42E-05*** |
| | | | | | | | | |
| # 4 (Coal) | 2.22E-03 | 1.61E-04 | 4.10E-04 | 0.00E+00 | 1.15E-04 | 0.00E+00 | 4.10E-04 | 6.32E-05 |
| ***# 4 TOTAL*** | ***2.22E-03*** | ***1.61E-04*** | ***4.10E-04*** | ***0.00E+00*** | ***1.15E-04*** | ***0.00E+00*** | ***4.10E-04*** | ***6.32E-05*** |
| | | | | | | | | |
| # 5 (Nat. Gas) | 4.39E-04 | 0.00E+00 | 1.57E-02 | 0.00E+00 | 3.76E-01 | 5.43E-01 | 7.11E-04 | 0.00E+00 |
| | | | | | | | | |
| # 5 (Fuel Oil)* | 1.48E-05 | 4.39E-06 | 2.28E-03 | 7.80E-05 | 0.00E+00 | 0.00E+00 | 4.28E-04 | 7.52E-06 |
| ***# 5 TOTAL*** | ***4.54E-04*** | ***4.39E-06*** | ***1.80E-02*** | ***7.80E-05*** | ***3.76E-01*** | ***5.43E-01*** | ***1.14E-03*** | ***7.52E-06*** |
| **GRAND TOTAL**** | **5.85E-03** | **3.95E-04** | **1.89E-02** | **7.80E-05** | **3.76E-01** | **5.43E-01** | **2.13E-03** | **1.61E-04** |

Potential Emissions from Boilers
BYU - Idaho

| | Potential Annual Emissions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Source ID | Arsenic | Beryllium | Cadmium | Chromium | Chromium+6 | Cobalt | Copper | Lead | Manganese | Mercury |
| | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) |
| # 2 (Coal) | 4.92E-03 | 0.00E+00 | 3.91E-04 | #VALUE! | #VALUE! | 0.00E+00 | 0.00E+00 | 6.19E-03 | 0.00E+00 | 0.00E+00 |
| ***# 2 TOTAL*** | ***4.92E-03*** | ***0.00E+00*** | ***3.91E-04*** | ***#VALUE!*** | ***#VALUE!*** | ***0.00E+00*** | ***0.00E+00*** | ***6.19E-03*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | | | | | | | |
| # 3 (Coal) | 7.38E-03 | 0.00E+00 | 5.86E-04 | #VALUE! | #VALUE! | 0.00E+00 | 0.00E+00 | 9.28E-03 | 0.00E+00 | 0.00E+00 |
| ***# 3 TOTAL*** | ***7.38E-03*** | ***0.00E+00*** | ***5.86E-04*** | ***#VALUE!*** | ***#VALUE!*** | ***0.00E+00*** | ***0.00E+00*** | ***9.28E-03*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | | | | | | | |
| # 4 (Coal) | 8.61E-03 | 0.00E+00 | 6.84E-04 | #VALUE! | #VALUE! | 0.00E+00 | 0.00E+00 | 1.08E-02 | 0.00E+00 | 0.00E+00 |
| ***# 4 TOTAL*** | ***8.61E-03*** | ***0.00E+00*** | ***6.84E-04*** | ***#VALUE!*** | ***#VALUE!*** | ***0.00E+00*** | ***0.00E+00*** | ***1.08E-02*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | | | | | | | |
| # 5 (Nat. Gas) | 4.18E-05 | 2.51E-06 | 2.30E-04 | 2.93E-04 | 8.78E-05 | 1.76E-05 | 1.78E-04 | 0.00E+00 | 7.94E-05 | 5.02E-05 |
| | | | | | | | | | | |
| # 5 (Fuel Oil)* | 3.86E-05 | 2.90E-05 | 2.90E-05 | 2.90E-05 | 8.69E-06 | 0.00E+00 | 5.80E-05 | 8.69E-05 | 5.80E-05 | 2.90E-05 |
| ***# 5 TOTAL*** | ***8.04E-05*** | ***3.15E-05*** | ***2.59E-04*** | ***3.22E-04*** | ***9.65E-05*** | ***1.76E-05*** | ***2.36E-04*** | ***8.69E-05*** | ***1.37E-04*** | ***7.91E-05*** |
| **GRAND TOTAL**** | **2.10E-02** | **3.15E-05** | **1.92E-03** | **#VALUE!** | **#VALUE!** | **1.76E-05** | **2.36E-04** | **2.64E-02** | **1.37E-04** | **7.91E-05** |

**Potential Emissions from Boilers**
BYU - Idaho

| Source ID | Nickel (ton/yr) | Selenium (ton/yr) | Vanadium (ton/yr) | Zinc (ton/yr) |
|---|---|---|---|---|
| # 2 (Coal) | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ***# 2 TOTAL*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | |
| # 3 (Coal) | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ***# 3 TOTAL*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | |
| # 4 (Coal) | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ***# 4 TOTAL*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** | ***0.00E+00*** |
| | | | | |
| # 5 (Nat. Gas) | 4.39E-04 | 5.02E-06 | 4.81E-04 | 6.06E-03 |
| | | | | |
| # 5 (Fuel Oil)* | 2.90E-05 | 1.45E-04 | 0.00E+00 | 3.86E-05 |
| ***# 5 TOTAL*** | ***4.68E-04*** | ***1.50E-04*** | ***4.81E-04*** | ***6.10E-03*** |
| **GRAND TOTAL**** | **4.68E-04** | **1.50E-04** | **4.81E-04** | **6.10E-03** |

Boiler Emission Factors
BYU - Idaho

| Boiler Type | $PM_{10}$ | $SO_2$ | VOC | $NO_x$ | CO | PAH |
|---|---|---|---|---|---|---|
| | | | | | | |
| Natural gas-fired (lb/MMscf) | | 0.6 | 5.5 | 50 | 84 | 6.98E-04 |
| | | | | | | |
| Fuel oil-fired (lb/1000 gal) | 3.3 | 56.8 | 0.2 | 20 | 5 | 6.06E-05 |
| ($lb/10^{12}$ Btu) | | | | | | |
| Coal-fired (lb/ton) | | 22.8 | 0 | 11 | 5 | 2.08E-05 |
| ($lb/10^{12}$ Btu)** | | | | | | |
| | Sulfur content of fuel oil = | | | 0.4 | % | |
| | Sulfur content of coal = | | | 0.6 | % | |
| | 1. Natural Gas Emission factors per 5th Edition AP-42, 1.4 Natural Gas Combus | | | | | |
| | Fuel Oil Emission Factors per 5th Edition AP-42, 1.3 Fuel Oil Combustion (9- | | | | | |
| | Coal Emission Factors per 5th Edition AP-42, 1.1 Bituminous and Subbitumin | | | | | |
| | 2. PM10/PM ratio for spreader stoker with multiclone = 0.65 (AP-42 Table 1.1-9 | | | | | |

Boiler Emission Factors
BYU - Idaho

| | Emission Factors[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Boiler Type | Benzene | Ethylbenzene | Formaldehyde | Napthalene | Hexane | Pentane | Toluene | o-Xylene |
| | | | | | | | | |
| Natural gas-fired (lb/MMscf) | 2.10E-03 | 0.00E+00 | 7.50E-02 | 0.00E+00 | 1.80E+00 | 2.60E+00 | 3.40E-03 | 0.00E+00 |
| | | | | | | | | |
| Fuel oil-fired (lb/1000 gal) | 2.14E-04 | 6.36E-05 | 3.30E-02 | 1.13E-03 | 0.00E+00 | 0.00E+00 | 6.20E-03 | 1.09E-04 |
| ($lb/10^{12}$ Btu) | | | | | | | | |
| Coal-fired (lb/ton) | 1.30E-03 | 9.40E-05 | 2.40E-04 | 0.00E+00 | 6.70E-05 | 0.00E+00 | 2.40E-04 | 3.70E-05 |
| ($lb/10^{12}$ Btu)** | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | stion (7-98) | | | | | | | |
| | 98) | | | | | | | |
| | ous Coal Combustion (9-98) | | | | | | | |
| | ) | | | | | | | |

Boiler Emission Factors
BYU - Idaho

| | Emission Factors[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Boiler Type | Arsenic | Beryllium | Cadmium | Total Chromium | Chromium +6* | Cobalt | Copper | Lead | Manganese | Mercury |
| Natural gas-fired (lb/MMscf) | 2.00E-04 | 1.20E-05 | 1.10E-03 | 1.40E-03 | 4.20E-04 | 8.40E-05 | 8.50E-04 | 0.00E+00 | 3.80E-04 | 2.40E-04 |
| | | | | | | | | | | |
| Fuel oil-fired (lb/1000 gal) | | | | | | | | | | |
| (lb/$10^{12}$ Btu) | 4 | 3 | 3 | 3 | 0.9 | 0 | 6 | 9 | 6 | 3 |
| Coal-fired (lb/ton) | | | | | | | | | | |
| (lb/$10^{12}$ Btu)** | 201.5 | | 16 | | #VALUE! | | | 253.5 | | |
| | * Assumes CR+6 is 30% of total chrome per AP-42, Tables 1.1-18 and 1.3-11 | | | | | | | | | |
| | ** AP-42, Table 1.1-17 (Uncontrolled spreader stoker - mid-point of range presented, assume 50% control by multiclones) | | | | | | | | | |

Boiler Emission Factors
BYU - Idaho

| Boiler Type | Nickel | Selenium | Vanadium | Zinc |
|---|---|---|---|---|
| | | | | |
| Natural gas-fired (lb/MMscf) | 2.10E-03 | 2.40E-05 | 2.30E-03 | 2.90E-02 |
| | | | | |
| Fuel oil-fired (lb/1000 gal) | | | | |
| ($lb/10^{12}$ Btu) | 3 | 15 | 0 | 4 |
| Coal-fired (lb/ton) | | | | |
| ($lb/10^{12}$ Btu)** | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| CAS No. | Pollutant | Natural Gas Emission Factor (lb/MMscf) | Fuel Oil Emission Factor (lb/1000 gal) | Coal Emission Factor (lb/ton) |
|---|---|---|---|---|
| 91-57-6 | 2-Methylnapthalene | 2.40E-05 | | |
| 56-49-5 | 3-Methylchloranthrene | 1.80E-06 | | |
| | 5-Methyl chrysene | | | 2.20E-08 |
| | 7,12-Dimethylbenz(a)anthracene | 1.60E-05 | | |
| 83-32-9 | Acenaphthene | 1.80E-06 | 2.11E-05 | 5.10E-07 |
| 203-96-8 | Acenaphthylene | 1.80E-06 | 2.53E-07 | 2.50E-07 |
| 120-12-7 | Anthracene | 2.40E-06 | 1.22E-06 | 2.10E-07 |
| 56-55-3 | Benz(a)anthracene | 1.80E-06 | 4.01E-06 | 8.00E-08 |
| 50-32-8 | Benzo(a)pyrene | 1.20E-06 | | 3.80E-08 |
| 205-99-2 | Benzo(b)fluoranthene | 1.80E-06 | 1.48E-06 | 1.10E-07 |
| 191-24-2 | Benzo(g,h,i)perylene | 1.20E-06 | 2.26E-06 | 2.70E-08 |
| 205-82-3 | Benzo(k)fluoranthene | 1.80E-06 | | |
| | Biphenyl | | | 1.70E-06 |
| 218-01-9 | Chrysene | 1.80E-06 | 2.38E-06 | 1.00E-07 |
| 53-70-3 | Dibenzo(a,h)anthracene | 1.20E-06 | 1.67E-06 | |
| 206-44-0 | Fluoranthene | 3.00E-06 | 4.84E-06 | 7.10E-07 |
| 86-73-7 | Fluorene | 2.80E-06 | 4.47E-06 | 9.10E-07 |
| 193-39-5 | Indeno(1,2,3-cd)pyrene | 1.80E-06 | 2.14E-06 | 6.10E-08 |
| 91-20-3 | Naphthalene | 6.10E-04 | | 1.30E-05 |
| 85-01-8 | Phenanathrene | 1.70E-05 | 1.05E-05 | 2.70E-06 |
| 129-00-0 | Pyrene | 5.00E-06 | 4.25E-06 | 3.30E-07 |
| ***Total PAH*** | | ***6.98E-04*** | ***6.06E-05*** | ***2.08E-05*** |

Potential Emissions from Generators
BYU - Idaho

| Source ID | Rated Capacity | | Operating Hours | Potential Hourly Emissions | | | | | | Potential Ann | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (kw) | (hp) | (hr/yr) | PM (lb/hr) | PM10 (lb/hr) | $SO_2$ (lb/hr) | VOC (lb/hr) | $NO_x$ (lb/hr) | CO (lb/hr) | PM (ton/yr) | PM10 (ton/yr) | $SO_2$ (ton/yr) |
| Diesel Generator 429 | 300 | 402 | 500 | 0.88 | 0.88 | 0.82 | 1.01 | 12.46 | 2.69 | 0.22 | 0.22 | 0.21 |
| Generator 477 | 100 | 134 | 500 | 0.29 | 0.29 | 0.27 | 0.34 | 4.15 | 0.90 | 0.07 | 0.07 | 0.07 |
| Generator AOE | 438 | 586.92 | 500 | 1.29 | 1.29 | 1.20 | 1.48 | 18.19 | 3.92 | 0.32 | 0.32 | 0.30 |
| Misc. Diesel Generators | 715 | 958.1 | 500 | 2.11 | 2.11 | 1.96 | 2.41 | 29.70 | 6.40 | 0.53 | 0.53 | 0.49 |
| **TOTAL** | | | | **4.58** | **4.58** | **4.27** | **5.23** | **64.51** | **13.90** | **1.14** | **1.14** | **1.07** |
| *EL* | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| * New Equipment | | | | | | | | | | | | |
| Exceed emission screening level | | | | | | | | | | | | |

Potential Emissions from Generators
BYU - Idaho

| Source ID | Rated Capacity | | Operating Hours | ual Emissions VOC | $NO_x$ | CO |
|---|---|---|---|---|---|---|
| | (kw) | (hp) | (hr/yr) | (ton/yr) | (ton/yr) | (ton/yr) |
| Diesel Generator 429 | 300 | 402 | 500 | 0.25 | 3.12 | 0.67 |
| Generator 477 | 100 | 134 | 500 | 0.08 | 1.04 | 0.22 |
| Generator AOE | 438 | 586.92 | 500 | 0.37 | 4.55 | 0.98 |
| Misc. Diesel Generators | 715 | 958.1 | 500 | 0.60 | 7.43 | 1.60 |
| **TOTAL** | | | | **1.31** | **16.13** | **3.48** |
| *EL* | | | | | | |
| | | | | | | |
| * New Equipment | | | | | | |
| Exceed emission screening level | | | | | | |

Generator Emission Factors
BYU - Idaho

| | Emission Factors[1] | | | | | |
|---|---|---|---|---|---|---|
| Source Type | PM | PM10 | $SO_2$ | TOC | $NO_x$ | CO |
| | (lb/hp-hr) | (lb/hp-hr) | (lb/hp-hr) | (lb/hp-hr) | (lb/hp-hr) | (lb/hp-hr) |
| Diesel Fired Emergency Generator | 0.0022 | 0.0022 | 0.00205 | 0.0025141 | 0.031 | 0.00668 |
| | | | | | | |
| | 1. Emission Factors per 5th Edition AP-42, 3.3 Gasoline and Diesel Industrial Engines | | | | | |

Generator Emission Factors
BYU - Idaho

| | Emission Factors[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Source Type | PAH | Benzene | Toluene | Xylenes | Propylene | 1,3-Butadiene | Formaldehyde | Acetaldehyde |
| | (lb/MMBtu) | (lb/MMBtu) | (lb/MMBtu) | (lb/MMBtu) | (lb/MMBtu) | (lb/MMBtu) | (lb/MMBtu) | (lb/MMBtu) |
| Diesel Fired Emergency Generator | 1.68E-04 | 9.33E-04 | 4.09E-04 | 2.85E-04 | 2.58E-03 | 3.91E-05 | 1.18E-03 | 7.67E-04 |
| | | | | | | | | |
| | | | | | | | | |

Generator Emission Factors
BYU - Idaho

| Source Type | Acrolein (lb/MMBtu) |
|---|---|
| Diesel Fired Emergency Generator | 9.25E-05 |
| | |
| | |

# APPENDIX B

# REPORT ON DISPERSION MODELING ANALYSIS

# REPORT ON MODELING ANALYSIS FOR BYU – IDAHO

## 1. SUMMARY:

The criteria pollutants covered by the BYU – Idaho permit that are subject to the requirements of modeling were oxides of nitrogen ($NO_x$), particulate matter with an aerodynamic diameter less than or equal to a nominal 10 μm ($PM_{10}$), sulfur dioxide ($SO_2$), and carbon monoxide (CO). The emission screening levels in IDAPA 58.01.01.586 were exceeded for five (6) toxic air pollutants (TAPs) emitted from Boiler No. 5 (the only new or modified source at the facility that triggers a TAP modeling analysis). Under the permit conditions in the permit, the modeling analysis of criteria pollutants and TAPs demonstrated compliance with the National Ambient Air Quality Standards (NAAQS) and Acceptable Ambient Concentrations for the TAPs for all applicable averaging periods.

## 2. DISCUSSION:

### 2.1 Applicable Air Quality Impact Limits

This facility is located in Rexburg, Idaho which is designated an attainment or unclassifiable area for $PM_{10}$, CO, $SO_2$, and $NO_x$. Therefore, total ambient impacts for these criteria pollutants must be below the NAAQS. The incremental ambient impacts for the TAPs from new or modified sources must be below the acceptable ambient concentrations. The dispersion modeling analysis compared facility impacts (including background concentrations) to the regulatory limits listed in Table 1.

**Table 1.** Applicable regulatory limits

| Pollutant | Averaging Period | Significant Contribution Levels ($\mu g/m^3$)[1, 2] | Regulatory Limit ($\mu g/m^3$)[3] |
|---|---|---|---|
| $PM_{10}$[4] | Annual | 1 | 50 |
| | 24-hour | 5 | 150 |
| $SO_2$[5] | 3-hour | 25 | 1,300 |
| | 24-hour | 5 | 365 |
| | Annual | 1.0 | 80 |
| CO[6] | 8-hour | 500 | 10,000 |
| | 1-hour | 2000 | 40,000 |
| $NO_x$[7] | Annual | 1 | 100 |
| Arsenic | Annual | N/A | 0.0023 |
| Beryllium | Annual | N/A | 0.0042 |
| Cadmium | Annual | N/A | 0.00056 |
| Chromium (VI) | Annual | N/A | 0.000083 |
| Nickel | Annual | N/A | 0.0042 |
| Formaldehyde | Annual | N/A | 0.077 |

1. IDAPA 58.01.01.006.93
2. Micrograms per cubic meter
3. IDAPA 58.01.01.577 for criteria pollutants and IDAPA 58.01.01.586 for toxic pollutants
4. Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers
5. Sulfur dioxide
6. Carbon monoxide
7. Oxides of nitrogen

## 2.2 Background Concentrations

When conducting NAAQS modeling for non-PSD sources (i.e., BYU), sources not explicitly included in the model are taken into account by adding a background concentration. DEQ provided the ambient air pollutants for the Rexburg area that were used in the calculation of the total NAAQS concentration. Table 2 lists background concentrations provided by DEQ.

**Table 2.** Ambient Air Background Concentrations

| Pollutant | Averaging Period | Background Concentration ($\mu g/m^3$) |
|---|---|---|
| $PM_{10}$ | Annual | 22 |
| | 24-hour | 81 |
| $SO_2$ | 3-hour | 42 |
| | 24-hour | 26 |
| | Annual | 8 |
| CO | 8-hour | 4,600 |
| | 1-hour | 13,800 |
| $NO_2$ | Annual | 32 |

Source: DEQ

## 2.3 Modeling Impact Assessment

The procedures in the State of Idaho's *Air Quality Modeling Guideline* (DEQ 2002), as well as the EPA documents *Guideline on Air Quality Models* (EPA 2001) were followed in conducting the modeling analysis.

The Industrial Source Complex Model (ISC), including the **P**lume **R**ise **M**odel **E**nhancements Model (PRIME), version 99020, was used in the compliance evaluation. All regulatory default options were used in the modeling. The area surrounding the facility within 3 kilometers is rural in nature although incorporated Rexburg is immediately north of the University. Per discussions with the DEQ, rural mixing heights were used in the model.

The remainder of the modeling analysis describes the emission rates, source parameters, building downwash parameters, ambient air boundary, receptor network, elevation data, meteorological data, and compliance evaluation.

Initial dispersion modeling of Boiler No. 5 showed compliance with all regulatory limits for all averaging periods. Because the concentrations modeled with Boiler No. 5 exceeded the significant contribution levels shown in Table 1, a full impact analysis that includes all non-fugitive point sources at the facility was required.

The short-term and annual emissions limits for all non-fugitive point sources at the facility are shown in Table 3. The existing stack parameters for each source are presented in Table 4. As shown in the next section on results, the existing conditions do not meet the NAAQS for short-term averaging times for $SO_2$ and $PM_{10}$.

A secondary analysis implementing additional permit conditions was performed to allow compliance with the NAAQS. Based on conversations with BYU – Idaho and successive dispersion modeling runs, two permit conditions would bring the facility into compliance as follows:

- The maximum heat input shall not exceed 113 MMBtu/hr averaged over each calendar day; and
- The minimum stack height on coal-fired boilers No. 2, No. 3, and No. 4 shall be 80 feet above the ground.

**Table 3.** Short- and Long-term Emissions Used in Modeling for BYU - Idaho Permitting Project

| Emissions Source | Source ID | Type of Emissions | $PM_{10}$ | $SO_2$ | CO | NOx | Formal-dehyde | Arsenic | Beryllium | Cadmium | Chrome VI | Nickel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26.67 MMBtu/hr Coal-Fired Boiler #2 | Boiler2 | Modeled Short-Term Emission Rate (lbs/hr) | 4.74 | 24.32 | 5.33 | NA | NA | NA | NA | NA | NA | NA |
| | | Annual Emissions (TPY) | 4.34 | 22.27 | 4.88 | 10.74 | 2.34E-04 | 4.92E-03 | 0 | 3.91E-04 | 9.20E-03 | 0 |
| | | Modeled Long-term Emission Rate[a] (lbs/hr) | 0.99 | 5.08 | NA | 2.45 | 5.35E-05 | 1.12E-03 | 0 | 8.92E-05 | 2.10E-03 | 0 |
| 40 MMBTU/hr Coal-Fired Boiler #3 | Boiler3 | Modeled Short-Term Emission Rate (lbs/hr) | 8.91 | 36.48 | 8.00 | NA | NA | NA | NA | NA | NA | NA |
| | | Annual Emissions (TPY) | 8.16 | 33.40 | 7.32 | 16.11 | 3.52E-04 | 7.38E-03 | 0 | 5.86E-04 | 1.38E-02 | 0 |
| | | Modeled Long-term Emission Rate[a] (lbs/hr) | 1.86 | 7.62 | NA | 3.68 | 8.03E-05 | 1.68E-03 | 0 | 1.34E-04 | 3.15E-03 | 0 |
| 46.67 MMBtu/hr Coal-Fired Boiler #4 | Boiler4 | Modeled Short-Term Emission Rate (lbs/hr) | 8.91 | 42.56 | 9.33 | NA | NA | NA | NA | NA | NA | NA |
| | | Annual Emissions (TPY) | 8.16 | 38.97 | 8.55 | 18.80 | 4.10E-04 | 8.61E-03 | 0 | 6.84E-04 | 1.61E-02 | 0 |
| | | Modeled Long-term Emission Rate[a] (lbs/hr) | 1.86 | 8.90 | NA | 4.29 | 9.36E-05 | 1.97E-03 | 0 | 1.56E-04 | 3.68E-03 | 0 |
| 51 MMBtu/hr Natural Gas-Fired Boiler #5 | Boiler5 | Modeled Short-Term Emission Rate (lbs/hr) | 2.31 | 19.60 | 4.20 | NA | NA | NA | NA | NA | NA | NA |
| | | Annual Emissions (TPY) | 9.90 | 4.40 | 17.90 | 11.83 | 1.80E-02 | 8.04E-05 | 3.15E-05 | 2.59E-04 | 1.93E-04 | 4.68E-04 |
| | | Modeled Long-term Emission Rate[a] (lbs/hr) | 2.26 | 0.92 | NA | 2.70 | 4.10E-03 | 1.84E-05 | 7.19E-06 | 5.91E-05 | 4.41E-05 | 1.07E-04 |
| Diesel-Fired Emergency Generator | Heat_Gen | Modeled Short-Term Emission Rate (lbs/hr) | 0.88 | 0.21 | 2.69 | NA | NA | NA | NA | NA | NA | NA |
| | | Annual Emissions (TPY) | 0.22 | 0.22 | 0.67 | 3.12 | NA | NA | NA | NA | NA | NA |
| | | Modeled Long-term Emission Rate[a] (lbs/hr) | 0.05 | 0.05 | NA | 0.71 | NA | NA | NA | NA | NA | NA |
| Diesel-Fired Emergency Generator | Kimb_Gen | Modeled Short-Term Emission Rate (lbs/hr) | 1.29 | 0.82 | 3.92 | NA | NA | NA | NA | NA | NA | NA |
| | | Annual Emissions (TPY) | 0.32 | 0.30 | 0.98 | 4.55 | NA | NA | NA | NA | NA | NA |
| | | Modeled Long-term Emission Rate[a] (lbs/hr) | 0.07 | 0.07 | NA | 1.04 | NA | NA | NA | NA | NA | NA |
| Diesel-Fired Emergency Generator | Hart_Gen | Modeled Short-Term Emission Rate (lbs/hr) | 0.29 | 0.82 | 0.90 | NA | NA | NA | NA | NA | NA | NA |
| | | Annual Emissions (TPY) | 0.07 | 0.07 | 0.22 | 1.04 | NA | NA | NA | NA | NA | NA |
| | | Modeled Long-term Emission Rate[a] (lbs/hr) | 0.02 | 0.02 | NA | 0.24 | NA | NA | NA | NA | NA | NA |

[a] Calculated by dividing the annual emissions in pounds by 8760 hours in a year

**Table 4.** Stack Parameters Used in Dispersion Modeling for BYU – Idaho Permitting Project

| Source | Stack Height: Existing Height (ft) | Stack Height: With Permit Conditions[a] (ft) | Diameter (ft) | Flow Rate (scfm) | Flow Rate (acfm) | Temp. (°F) | UTMx (m) | UTMy (m) | Elevation (ft) |
|---|---|---|---|---|---|---|---|---|---|
| Boiler5 | 64 | 64 | 3.5 | 18,000 | 30,316 | 300 | 436,898 | 4,851,716 | 4,890 |
| Boiler2 | 59 | 80 | 2.5 | 8,500 | 19,027 | 550 | 436,871 | 4,851,715 | 4,890 |
| Boiler3 | 59 | 80 | 3.17 | 16,000 | 35,816 | 550 | 436,875 | 4,851,715 | 4,890 |
| Boiler4 | 59 | 80 | 3.17 | 16,000 | 35,816 | 550 | 436,890 | 4,851,716 | 4,890 |
| Heat Gen | 47 | 47 | 0.5 | 853 | 2,570 | 900 | 436,894 | 4,851,708 | 4,890 |
| Kimb_Gen | 12 | 12 | 160[b] | 1,313 | 3958 | 1002 | 437,266 | 4,851,610 | 4,963 |
| Hart_Gen | 6.3 | 6.3 | 0.167 | 83 | 250 | 1002 | 437,008 | 4,851,994 | 4,963 |

a. Reflects the minimum stack height required by permit conditions on coal-fired boilers No. 2, No. 3, and No. 4.

b. Virtual diameter, calculated because source emits horizontally restricting vertical momentum; however, buoyancy flux was assumed to be conserved. The diameter was calculated using the following equation:

$$\text{Virtual diameter} = 31.6 * d_s * v_s^{0.5}$$

Where:

$d_s$ = actual inside diameter (0.203 m)

$v_s$ = actual exit velocity (57.7 m/s)

As shown in Table 4, coal-fired boiler stack heights were adjusted to allow minimization of building downwash effects. This was in the form of a permit condition requiring the applicant to raise the coal-fired boilers stacks on No. 2, No. 3, and No. 4 to a minimum height of 80 feet above the base elevation.

The methodology of modeling the short-term averaging periods (i.e., 24 hours or less) was different than annual-averaging period because modeling short-term averaging times was affected by the permit condition that limits BYU – Idaho to 113 MMBtu/hr of heat input averaged over each calendar day. Because operation of all four boilers simultaneously would exceed this permit condition, the three worst boilers were chosen to be modeled. Boilers No. 2, No. 3, and No. 4 were chosen because they would have the highest emissions and worst dispersion parameters compared with the other boiler combinations and still meet the 113 MMBtu/hr permit restriction. Therefore, all short-term averaging times were modeled with the coal-fired Boilers No. 2, No. 3, and No. 4 plus three emergency generators.

The methodology for annual averaging periods assumed operation of all boilers in addition to the three emergency generators for the annual emission rates and the stack parameters as shown in Tables 3 and 4, respectively.

The reasons that the dispersion modeling analysis included the generators at the Heat Plant, Hart building, and Kimball building and not the others were because:

- These three are the largest, except for the portable one, which is 250kW, it was not included because it is not a fixed source.
- The emissions associated with generators less than 100 kW are less significant because their emissions of criteria pollutants are below 1 pound per hour.
- The small generators (< 100 kW) would not likely affect the area of impact.

The physical effluent characteristics of the Kimball Generator was manipulated per DEQ guidance because the hot gases exiting the stack are horizontally emitted. Per DEQ guidance, horizontal releases are assumed to have 0.001 meters per second exit velocity to restrict vertical momentum. Horizontal sources are further modified by calculating a fictitious diameter such that buoyancy flux is conserved. When a hot obstructed source is an issue the exit diameter is adjusted by the following equation to conserve buoyancy:

$$\text{Virtual diameter} = 31.6 * d_s * v_s^{0.5}$$

Where

$d_s$ = actual inside stack diameter (0.203 m)
$v_s$ = actual stack exit velocity (57.73 m/s)

Stack heights, buildings, and other structures were included in the analysis because building downwash of released emissions may influence the plumes (which will tend to bring the plume closer to the ground near the structures). Buildings (and each building's height) used in the downwash calculations were the Heat Plant (39'), Hart (57'), Physical Plant (34'), Rigby (28.5), Physical (34'), Austin (57'), Taylor (51'), Kimball (32), and Bibbulph (28.5') buildings. The elevation and location of each building at the facility was used in the U.S. EPA's Building Profile Input Program-PRIME (95086) to calculate the building downwash parameters.

The ambient air boundary for this project includes areas within the property boundary because public access to the University is unrestricted. All calculations of dispersion modeling impacts occur along or near the outside of this ambient air boundary.

Four sets of Cartesian grids at various spacing were arranged around the facility. One coarse grid was spaced at 500 meters and it extended out to 10,000m from the site. Two fine grids, 100 and 50 meters, of receptors were placed 1,000m and 600m out from the site, respectively. Ambient air boundary receptors spaced at 25m were extended out to 200m from the site. A total of 2,731 receptors were used.

The elevations of each receptor were derived from 30m resolution Digital Elevation Model (DEM) 7.5-minute quadrangle maps for the area.

Per discussions with DEQ, the closest applicable meteorological station to the site is in Pocatello, Idaho. The National Weather Service's (NWS) Pocatello Airport meteorological site collects surface air data. These data were combined with Boise's upper air meteorological data. The most recent 5-year data set was taken from EPA's SCRAM website.

## 3. MODELING RESULTS FOR CRITERIA POLLUTANTS

The results presented in Table 5 show that the ambient air impacts due to the current facility violate the NAAQS for short-term averaging times for $SO_2$ and $PM_{10}$. The primary contributors to these high concentrations are the coal-fired boilers. These significant impacts occur at ground-level receptors in the immediate vicinity of the Heat Plant Building. Under high wind events, the plumes from the coal-fired stacks, in addition to the other stacks, are under the influence of downwash effects. Because the coal-fired boilers stacks are only about 20 feet above the Heat Plant roof, downwash effects and dispersion calculations show increased concentrations at the ground-level receptors compared with similar stacks that are not influenced by building downwash.

Table 6 shows the dispersion modeling concentrations associated with the permit conditions requiring increased stack heights for Boilers No. 2, No. 3, and No. 4 and also, a limit on heat input. As a result of these conditions, BYU – Idaho would meet the NAAQS for all pollutants for all averaging times.

**Table 5.** NAAQS Impact Analysis With Existing Conditions For BYU – Idaho

| Pollutant | Averaging Period | Total Ambient Impact, $\mu g/m^3$ | Ambient Background Concentration, $\mu g/m^3$ | Total NAAQS Concentration, $\mu g/m^3$ | NAAQS, $\mu g/m^3$ | Percent of NAAQS, % |
|---|---|---|---|---|---|---|
| CO[a] | 1-hour | 393 | 13,800 | 14,193 | 40,000 | 35% |
| CO[a] | 8-hour | 330 | 4,600 | 4,930 | 10,000 | 49% |
| $SO_2$[a] | 3-hour | 1,355 | 42 | 1,397 | 1,300 | 107% |
| $SO_2$[a] | 24-hour | 1,040 | 26 | 1,066 | 365 | 292% |
| $SO_2$[c] | Annual | 63 | 8 | 71 | 80 | 89% |
| $PM_{10}$[b] | 24-hour | 179 | 81 | 260 | 150 | 173% |
| $PM_{10}$[c] | annual | 15 | 22 | 37 | 50 | 74% |
| $NO_x$[c] | annual | 37 | 32 | 69 | 100 | 69% |

a. Compliance based on high-second high concentration at each receptor

b. Compliance based on high sixth high concentration modeled at each receptor with 5 years of meteorological data

c. Compliance based on maximum concentration at each receptor

**Table 6.** NAAQS Impact Analysis With Additional Permit Conditions For BYU – Idaho

| Pollutant | Averaging Period | Total Ambient Impact, $\mu g/m^3$ | Ambient Background Concentration, $\mu g/m^3$ | Total NAAQS Concentration, $\mu g/m^3$ | NAAQS, $\mu g/m^3$ | Percent of NAAQS, % |
|---|---|---|---|---|---|---|
| CO[a] | 1-hour | 264 | 13,800 | 14,064 | 40,000 | 35% |
| CO[a] | 8-hour | 113 | 4,600 | 4,713 | 10,000 | 47% |
| $SO_2$[a] | 3-hour | 511 | 42 | 553 | 1,300 | 43% |
| $SO_2$[a] | 24-hour | 307 | 26 | 333 | 365 | 91% |
| $SO_2$[c] | Annual | 13 | 8 | 21 | 80 | 26% |
| $PM_{10}$[b] | 24-hour | 66 | 81 | 147 | 150 | 98% |
| $PM_{10}$[c] | Annual | 5 | 22 | 27 | 50 | 54% |
| $NO_x$[c] | Annual | 12 | 32 | 44 | 100 | 44% |

Note:
All averaging times reflect the minimum stack height required by permit on coal-fired boilers No. 2, No. 3, and No. 4.

All averaging times of 24-hours or less were modeled with the following permit condition:

*The maximum heat input of 113 MMBtu/hr averaged over each calendar day. Because of this permit condition* Boilers No. 2, 3, and No. 4 were modeled together at their full heat input with no other boilers in operation. Three emergency generators were included in the modeling runs as well.

a. Compliance based on high-second high concentration at each receptor

b. Compliance based on high sixth high concentration modeled at each receptor with 5 years of meteorological data

c. Compliance based on maximum concentration at each receptor

4. Toxic Air Pollutants

Because Boiler No. 5 is the only new or modified source at the facility, a TAP analysis is only triggered by this source. The maximum annual concentrations were modeled using the emissions shown in Table 3 for six TAPs that exceeded their emission screening levels for Boiler No. 5. The modeling results of Boiler No. 5 are presented in Table 7 and based on this modeling, ambient concentrations for carcinogens due to Boiler No. 5 are acceptable.

As shown in Table 8, dispersion modeling that includes all sources of formaldehyde, arsenic, beryllium, cadmium, chromium (VI), and nickel (as limited by the permit conditions specified in Section 2.3) showed concentrations in excess of the acceptable ambient concentrations for carcinogens (AACC) for arsenic and chromium (VI). As noted above, the authority to ensure compliance with the AACCs is limited to Boiler No. 5.

**Table 7**. Toxic Impact Analysis of Boiler No. 5 For BYU – Idaho

| Toxic Pollutant | Maximum Concentration ($\mu g/m^3$) | Averaging Time | IDAPA AACC ($\mu g/m^3$) | Acceptable? |
|---|---|---|---|---|
| Formaldehyde | 0.004 | Annual | 0.077 | yes |
| Arsenic | 0.00002 | Annual | 0.00023 | yes |
| Beryllium | 0.00001 | Annual | 0.0042 | yes |
| Cadmium | 0.00006 | Annual | 0.00056 | yes |
| Chromium (VI) | 0.00002 | Annual | 0.000083 | yes |
| Nickel | 0.0001 | Annual | 0.0042 | yes |
| AACC = Acceptable Ambient Concentrations for Carcinogens | | | | |

**Table 8**. Toxic Impact Analysis With Permit Conditions at BYU - Idaho (All Sources)

| Toxic Pollutant | Maximum Concentration ($\mu g/m^3$) | Averaging Time | IDAPA AACC ($\mu g/m^3$) | Under IDAPA AACC? | Percent of AACC, % |
|---|---|---|---|---|---|
| Formaldehyde | 0.004 | Annual | 0.077 | yes | 6% |
| Arsenic | 0.00263 | Annual | 0.00023 | no | 1143% |
| Beryllium | 0.00002 | Annual | 0.0042 | yes | 0.5% |
| Cadmium | 0.00026 | Annual | 0.00056 | yes | 46% |
| Chromium (VI) | 0.00493 | Annual | 0.000083 | no | 5940% |
| Nickel | 0.0001 | Annual | 0.0042 | yes | 2% |
| AACC = Acceptable Ambient Concentrations for Carcinogens | | | | | |

5. REFERENCES:

DEQ, 2002. Idaho Department of Environmental Quality, 2002. *State of Idaho Air Quality Modeling Guideline*, Boise, Idaho, May.

EPA, 2001. U.S. EPA, 2001. 40CFR51 – *Requirements for Preparation, Adoption, and Submittal of State Implementation Plans (Guideline on Air Quality Models)*.

# Example of Short-term Analysis for $PM_{10}$

```
*** ISC3P - VERSION 99020 ***
 *** BYU  Max ST ER from Operating Permit   BYUSTBACKDEQPM.BST   01/29/03 ***
 *** Model Executed on 01/29/03 at 09:56:16 ***


  BEE-Line ISC3P "BEEST" Version 8.50

  Input File - P:\030000\030192\030192.0016.001\BEEST\Backup Generators\BYUSTBACKUPDEQPM_87_PM_10.DTA

 Output File - P:\030000\030192\030192.0016.001\BEEST\Backup Generators\BYUSTBACKUPDEQPM_87_PM_10.LST

    Met File - P:\030000\030192\030192.0016.001\Met\pocboi8791.asc


      Number of sources -          6
 Number of source groups -          7
    Number of receptors -       2726


                                                *** POINT SOURCE DATA ***

             NUMBER EMISSION RATE                    BASE     STACK    STACK     STACK     STACK    BUILDING EMISSION
RATE
    SOURCE     PART.  (GRAMS/SEC)     X         Y     ELEV.    HEIGHT   TEMP.   EXIT VEL. DIAMETER   EXISTS   SCALAR
VARY
      ID       CATS.                (METERS)  (METERS) (METERS) (METERS) (DEG.K)  (M/SEC)  (METERS)              BY
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- -

   KIMB_GEN      0   0.16254E+00  437265.7 4851610.5  1512.7     3.66   812.25     0.00    48.77      YES
   HART_GEN      0   0.36540E-01  437008.0 4851993.5  1512.7     1.93   812.25    57.73     0.05      YES
   BOILER2       0   0.59724E+00  436870.7 4851715.0  1490.5    24.38   560.93    19.69     0.76      YES
   BOILER4       0   0.11227E+01  436890.2 4851715.5  1490.5    24.38   560.93    23.05     0.97      YES
   GEN1          0   0.11088E+00  436893.8 4851707.5  1490.5    14.33   755.37    66.49     0.15      YES
   BOILER3       0   0.11227E+01  436875.0 4851715.0  1490.5    24.38   560.93    23.10     0.97      YES

                                          *** SOURCE IDs DEFINING SOURCE GROUPS ***

 GROUP ID                                                SOURCE IDs


  ALL        KIMB_GEN, HART_GEN, BOILER2 , BOILER4 , GEN1    , BOILER3 ,

  KIMB_GEN   KIMB_GEN,

  HART_GEN   HART_GEN,

  BOILER2    BOILER2 ,

  BOILER4    BOILER4 ,

  GEN1       GEN1    ,

  BOILER3    BOILER3 ,


                                          *** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

                                       ** CONC OF PM_10     IN MICROGRAMS/M**3                      **

                                                    DATE
 NETWORK
 GROUP ID                          AVERAGE CONC     (YYMMDDHH)             RECEPTOR (XR, YR, ZELEV, ZFLAG)     OF TYPE
 GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
 ALL      HIGH  1ST HIGH VALUE IS      79.79086  ON 89031424: AT (  436977.00,  4851764.00,   1493.61,      0.00)  DC
     NA
          HIGH  2ND HIGH VALUE IS      73.03221  ON 90112724: AT (  436977.00,  4851764.00,   1493.61,      0.00)  DC
     NA
          HIGH  6TH HIGH VALUE IS      66.00025  ON 89061624: AT (  436952.00,  4851764.00,   1493.22,      0.00)  DC
     NA
```

```
KIMB_GEN HIGH  1ST HIGH VALUE IS      8.67735  ON 90112724: AT (  437477.00,  4851714.00,   1516.50,      0.00)  DC
    NA
         HIGH  2ND HIGH VALUE IS      7.80164c ON 88051224: AT (  437327.00,  4851464.00,   1522.29,      0.00)  DC
    NA
         HIGH  6TH HIGH VALUE IS      6.77966  ON 89031424: AT (  437427.00,  4851664.00,   1517.20,      0.00)  DC
    NA
HART_GEN HIGH  1ST HIGH VALUE IS     12.05293  ON 90011924: AT (  437027.00,  4852014.00,   1487.48,      0.00)  DC
    NA
         HIGH  2ND HIGH VALUE IS     10.96236  ON 91121924: AT (  437027.00,  4852014.00,   1487.48,      0.00)  DC
    NA
         HIGH  6TH HIGH VALUE IS      9.76675c ON 89011124: AT (  437027.00,  4852014.00,   1487.48,      0.00)  DC
    NA
BOILER2  HIGH  1ST HIGH VALUE IS     16.19253  ON 90112124: AT (  436952.00,  4851789.00,   1491.90,      0.00)  DC
    NA
         HIGH  2ND HIGH VALUE IS     15.70320  ON 89022024: AT (  436952.00,  4851789.00,   1491.90,      0.00)  DC
    NA
         HIGH  6TH HIGH VALUE IS     14.05912  ON 87021424: AT (  436952.00,  4851764.00,   1493.22,      0.00)  DC
    NA
BOILER4  HIGH  1ST HIGH VALUE IS     30.11375  ON 89031424: AT (  436977.00,  4851764.00,   1493.61,      0.00)  DC
    NA
         HIGH  2ND HIGH VALUE IS     29.77310  ON 90112724: AT (  436977.00,  4851764.00,   1493.61,      0.00)  DC
    NA
         HIGH  6TH HIGH VALUE IS     25.16775  ON 87021424: AT (  436977.00,  4851764.00,   1493.61,      0.00)  DC
    NA
GEN1     HIGH  1ST HIGH VALUE IS     24.16703c ON 91013024: AT (  436852.03,  4851689.00,   1489.19,      0.00)  DC
    NA
         HIGH  2ND HIGH VALUE IS     21.10023c ON 89020224: AT (  436877.00,  4851689.00,   1490.59,      0.00)  DC
    NA
         HIGH  6TH HIGH VALUE IS     19.18015  ON 89020324: AT (  436877.00,  4851689.00,   1490.59,      0.00)  DC
    NA
BOILER3  HIGH  1ST HIGH VALUE IS     26.67056  ON 89031424: AT (  436977.00,  4851764.00,   1493.61,      0.00)  DC
    NA
         HIGH  2ND HIGH VALUE IS     24.17604  ON 89010624: AT (  437002.00,  4851789.00,   1493.70,      0.00)  DC
    NA
         HIGH  6TH HIGH VALUE IS     21.18285  ON 87021424: AT (  436952.00,  4851764.00,   1493.22,      0.00)  DC
    NA
```

## Example of Annual Analysis for $PM_{10}$

```
*** ISC3P - VERSION 99020 ***
 *** BYU  Max LT ER from Operating Permit   BYUSTBACKDEQlt.BST   01/28/03 ***
 *** Model Executed on 01/28/03 at 18:13:26 ***


  BEE-Line ISC3P "BEEST" Version 8.10

  Input File - P:\030000\030192\030192.0016.001\BEEST\Backup Generators\BYUSTBACKUPDEQlt_90_PM_10.DTA
          Output File - P:\030000\030192\030192.0016.001\BEEST\Backup Generators\BYUSTBACKUPDEQlt_90_PM_10.LST
                      Met File - P:\030000\030192\030192.0016.001\Met\pocboi90.asc


      Number of sources -          7
 Number of source groups -          8
    Number of receptors -       2728

                                                *** POINT SOURCE DATA ***

             NUMBER EMISSION RATE                    BASE     STACK   STACK    STACK     STACK    BUILDING EMISSION
RATE
    SOURCE     PART.  (GRAMS/SEC)     X         Y     ELEV.    HEIGHT  TEMP.   EXIT VEL. DIAMETER   EXISTS   SCALAR
VARY
      ID       CATS.                (METERS)  (METERS) (METERS) (METERS) (DEG.K)  (M/SEC)  (METERS)              BY
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- -

   KIMB_GEN      0   0.88200E-02  437265.7 4851610.5  1512.7     3.66   812.25     0.00    48.77      YES
   HART_GEN      0   0.25200E-02  437008.0 4851993.5  1512.7     1.93   812.25    57.73     0.05      YES
   BOILER2       0   0.12474E+00  436870.7 4851715.0  1490.5    24.38   560.93    19.69     0.76      YES
   BOILER4       0   0.23474E+00  436890.3 4851715.5  1490.5    24.38   560.93    23.05     0.97      YES
   GEN1          0   0.63000E-02  436893.8 4851707.5  1490.5    14.33   755.37    66.49     0.15      YES
   BOILER3       0   0.23474E+00  436875.0 4851715.0  1490.5    24.38   560.93    23.10     0.97      YES
   BOILER5       0   0.28489E+00  436898.0 4851716.0  1490.5    19.51   422.04    16.01     1.07      YES

                                          *** SOURCE IDs DEFINING SOURCE GROUPS ***

 GROUP ID                                                SOURCE IDs

  ALL        KIMB_GEN, HART_GEN, BOILER2 , BOILER4 , GEN1    , BOILER3 , BOILER5 ,
  KIMB_GEN   KIMB_GEN,
  HART_GEN   HART_GEN,
  BOILER2    BOILER2 ,
  BOILER4    BOILER4 ,
  GEN1       GEN1    ,
```

BOILER3 BOILER3 ,
BOILER5 BOILER5 ,

*** THE SUMMARY OF MAXIMUM PERIOD ( 8760 HRS) RESULTS ***

** CONC OF PM_10 IN MICROGRAMS/M**3 **

| GROUP ID | | AVERAGE CONC | RECEPTOR (XR, YR, ZELEV, ZFLAG) | OF TYPE | NETWORK GRID-ID |
|---|---|---|---|---|---|
| ALL | 1ST HIGHEST VALUE IS | 4.94188 AT ( | 436952.00, 4851764.00, 1493.22, 0.00) | DC | NA |
| | 2ND HIGHEST VALUE IS | 4.57005 AT ( | 436977.00, 4851764.00, 1493.61, 0.00) | DC | NA |
| | 3RD HIGHEST VALUE IS | 4.53399 AT ( | 436977.00, 4851789.00, 1492.70, 0.00) | DC | NA |
| | 4TH HIGHEST VALUE IS | 4.41079 AT ( | 436952.00, 4851789.00, 1491.90, 0.00) | DC | NA |
| | 5TH HIGHEST VALUE IS | 4.36979 AT ( | 437002.00, 4851789.00, 1493.70, 0.00) | DC | NA |
| | 6TH HIGHEST VALUE IS | 4.10685 AT ( | 437002.00, 4851814.00, 1493.00, 0.00) | DC | NA |
| KIMB_GEN | 1ST HIGHEST VALUE IS | 0.08510 AT ( | 437427.00, 4851664.00, 1517.20, 0.00) | DC | NA |
| | 2ND HIGHEST VALUE IS | 0.08337 AT ( | 437477.00, 4851714.00, 1516.50, 0.00) | DC | NA |
| | 3RD HIGHEST VALUE IS | 0.06590 AT ( | 437477.00, 4851664.00, 1519.31, 0.00) | DC | NA |
| | 4TH HIGHEST VALUE IS | 0.05414 AT ( | 437577.00, 4851814.00, 1517.11, 0.00) | DC | NA |
| | 5TH HIGHEST VALUE IS | 0.05076 AT ( | 437577.00, 4851714.00, 1520.19, 0.00) | DC | NA |
| | 6TH HIGHEST VALUE IS | 0.04487 AT ( | 437427.00, 4851614.00, 1519.89, 0.00) | DC | NA |
| HART_GEN | 1ST HIGHEST VALUE IS | 0.35464 AT ( | 437027.00, 4852014.00, 1487.48, 0.00) | DC | NA |
| | 2ND HIGHEST VALUE IS | 0.10283 AT ( | 436977.00, 4851914.00, 1487.91, 0.00) | DC | NA |
| | 3RD HIGHEST VALUE IS | 0.10116 AT ( | 437002.00, 4851914.00, 1489.41, 0.00) | DC | NA |
| | 4TH HIGHEST VALUE IS | 0.09341 AT ( | 436952.00, 4851914.00, 1486.39, 0.00) | DC | NA |
| | 5TH HIGHEST VALUE IS | 0.09107 AT ( | 437077.00, 4852014.00, 1489.01, 0.00) | DC | NA |
| | 6TH HIGHEST VALUE IS | 0.07858 AT ( | 437002.00, 4851889.00, 1490.69, 0.00) | DC | NA |
| BOILER2 | 1ST HIGHEST VALUE IS | 0.59295 AT ( | 436952.00, 4851789.00, 1491.90, 0.00) | DC | NA |
| | 2ND HIGHEST VALUE IS | 0.57069 AT ( | 436952.00, 4851764.00, 1493.22, 0.00) | DC | NA |
| | 3RD HIGHEST VALUE IS | 0.56494 AT ( | 436977.00, 4851789.00, 1492.70, 0.00) | DC | NA |
| | 4TH HIGHEST VALUE IS | 0.54713 AT ( | 436977.00, 4851814.00, 1491.69, 0.00) | DC | NA |
| | 5TH HIGHEST VALUE IS | 0.54144 AT ( | 436927.00, 4851764.00, 1492.30, 0.00) | DC | NA |
| | 6TH HIGHEST VALUE IS | 0.53522 AT ( | 436952.00, 4851814.00, 1490.69, 0.00) | DC | NA |
| BOILER4 | 1ST HIGHEST VALUE IS | 1.23091 AT ( | 436952.00, 4851764.00, 1493.22, 0.00) | DC | NA |
| | 2ND HIGHEST VALUE IS | 1.17387 AT ( | 436977.00, 4851764.00, 1493.61, 0.00) | DC | NA |
| | 3RD HIGHEST VALUE IS | 1.12570 AT ( | 436977.00, 4851789.00, 1492.70, 0.00) | DC | NA |
| | 4TH HIGHEST VALUE IS | 1.11193 AT ( | 437002.00, 4851789.00, 1493.70, 0.00) | DC | NA |
| | 5TH HIGHEST VALUE IS | 1.04097 AT ( | 436952.00, 4851789.00, 1491.90, 0.00) | DC | NA |
| | 6TH HIGHEST VALUE IS | 1.01794 AT ( | 437027.00, 4851789.00, 1494.50, 0.00) | DC | NA |

*** THE SUMMARY OF MAXIMUM PERIOD ( 8760 HRS) RESULTS ***

** CONC OF PM_10 IN MICROGRAMS/M**3 **

| GROUP ID | | AVERAGE CONC | RECEPTOR (XR, YR, ZELEV, ZFLAG) | OF TYPE | NETWORK GRID-ID |
|---|---|---|---|---|---|
| GEN1 | 1ST HIGHEST VALUE IS | 0.44588 AT ( | 436902.00, 4851739.00, 1491.60, 0.00) | DC | NA |
| | 2ND HIGHEST VALUE IS | 0.34653 AT ( | 436927.00, 4851739.00, 1493.00, 0.00) | DC | NA |
| | 3RD HIGHEST VALUE IS | 0.28959 AT ( | 436877.00, 4851739.00, 1490.20, 0.00) | DC | NA |
| | 4TH HIGHEST VALUE IS | 0.23329 AT ( | 436927.00, 4851764.00, 1492.30, 0.00) | DC | NA |
| | 5TH HIGHEST VALUE IS | 0.23094 AT ( | 436877.00, 4851689.00, 1490.59, 0.00) | DC | NA |
| | 6TH HIGHEST VALUE IS | 0.20623 AT ( | 436902.00, 4851764.00, 1490.99, 0.00) | DC | NA |
| BOILER3 | 1ST HIGHEST VALUE IS | 0.75147 AT ( | 436977.00, 4851789.00, 1492.70, 0.00) | DC | NA |
| | 2ND HIGHEST VALUE IS | 0.74131 AT ( | 436952.00, 4851789.00, 1491.90, 0.00) | DC | NA |
| | 3RD HIGHEST VALUE IS | 0.73777 AT ( | 436952.00, 4851764.00, 1493.22, 0.00) | DC | NA |
| | 4TH HIGHEST VALUE IS | 0.72029 AT ( | 437002.00, 4851814.00, 1493.00, 0.00) | DC | NA |
| | 5TH HIGHEST VALUE IS | 0.71232 AT ( | 437002.00, 4851789.00, 1493.70, 0.00) | DC | NA |
| | 6TH HIGHEST VALUE IS | 0.70403 AT ( | 436977.00, 4851814.00, 1491.69, 0.00) | DC | NA |
| BOILER5 | 1ST HIGHEST VALUE IS | 2.19768 AT ( | 436952.00, 4851764.00, 1493.22, 0.00) | DC | NA |
| | 2ND HIGHEST VALUE IS | 2.09184 AT ( | 436977.00, 4851764.00, 1493.61, 0.00) | DC | NA |
| | 3RD HIGHEST VALUE IS | 1.94325 AT ( | 436977.00, 4851789.00, 1492.70, 0.00) | DC | NA |
| | 4TH HIGHEST VALUE IS | 1.89955 AT ( | 437002.00, 4851789.00, 1493.70, 0.00) | DC | NA |
| | 5TH HIGHEST VALUE IS | 1.85991 AT ( | 436952.00, 4851789.00, 1491.90, 0.00) | DC | NA |
| | 6TH HIGHEST VALUE IS | 1.82188 AT ( | 437002.00, 4851764.00, 1494.10, 0.00) | DC | NA |